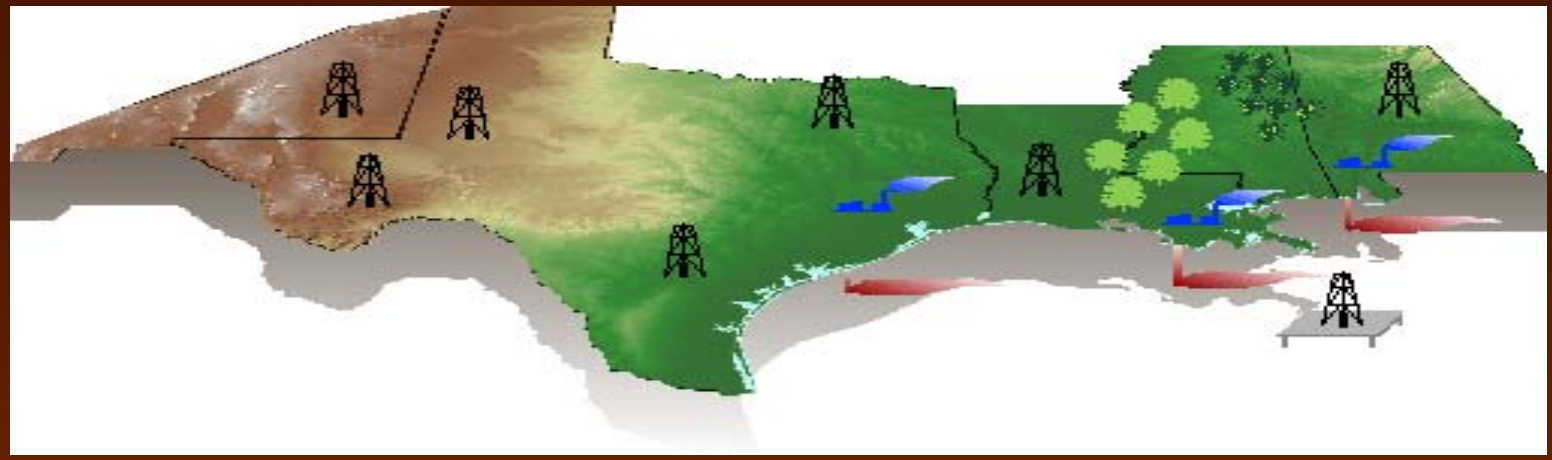

QUICK-LOOK ASSESSMENTS TO IDENTIFY OPTIMAL CO_2 EOR STORAGE SITES

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Outline

- Objectives
- Multistage Methodology
  - Stage 1: Screening of candidate reservoirs
    - Results
  - Stage 2: Quick-Look dimensionless model to estimate recovery and storage potentials
    - Results
  - Stage 3: Detailed reservoir characterization
- Summary

Objectives

- Develop a multistage quick-look methodology to identifying optimal CO_2 EOR storage sites.
  - Identify miscible CO_2 EOR candidate reservoirs with potential for EOR CO_2 sequestration.
  - Estimate oil recovery and CO_2 sequestration volumes through dimensionless modeling.
  - Comprehensive description of selected top sites through reservoir characterization

Methodology

Stage 1: Screening of candidate reservoirs

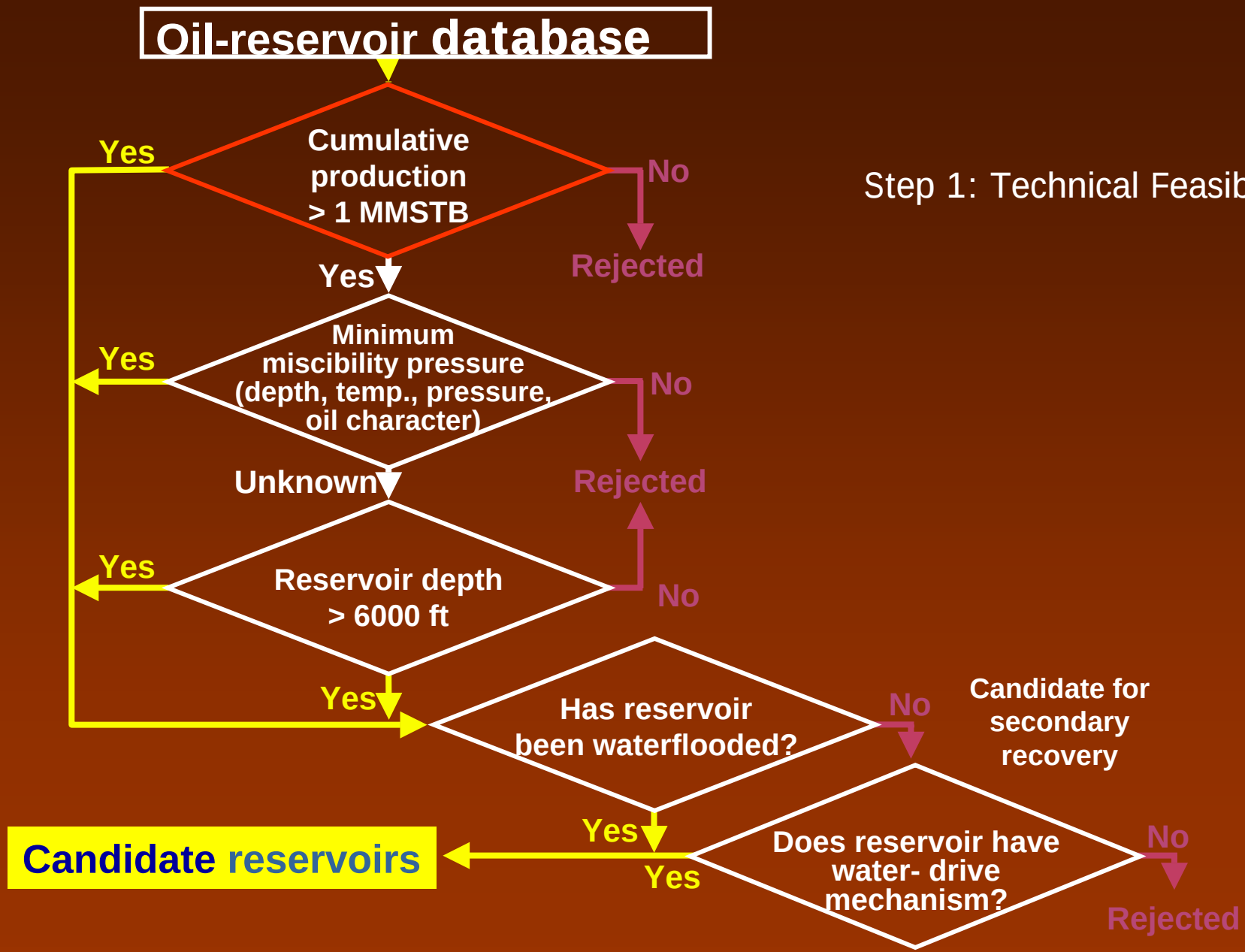
- Sources of Data

  Texas: Atlas of Major Texas Oil Reservoirs, Atlas of Major Texas Gas Reservoirs, Railroad Commission of Texas, others

  Louisiana: TORIS database, others

  Alabama and Mississippi: Alabama Geologic Survey, others

Stage 1: Screening of candidate reservoirs

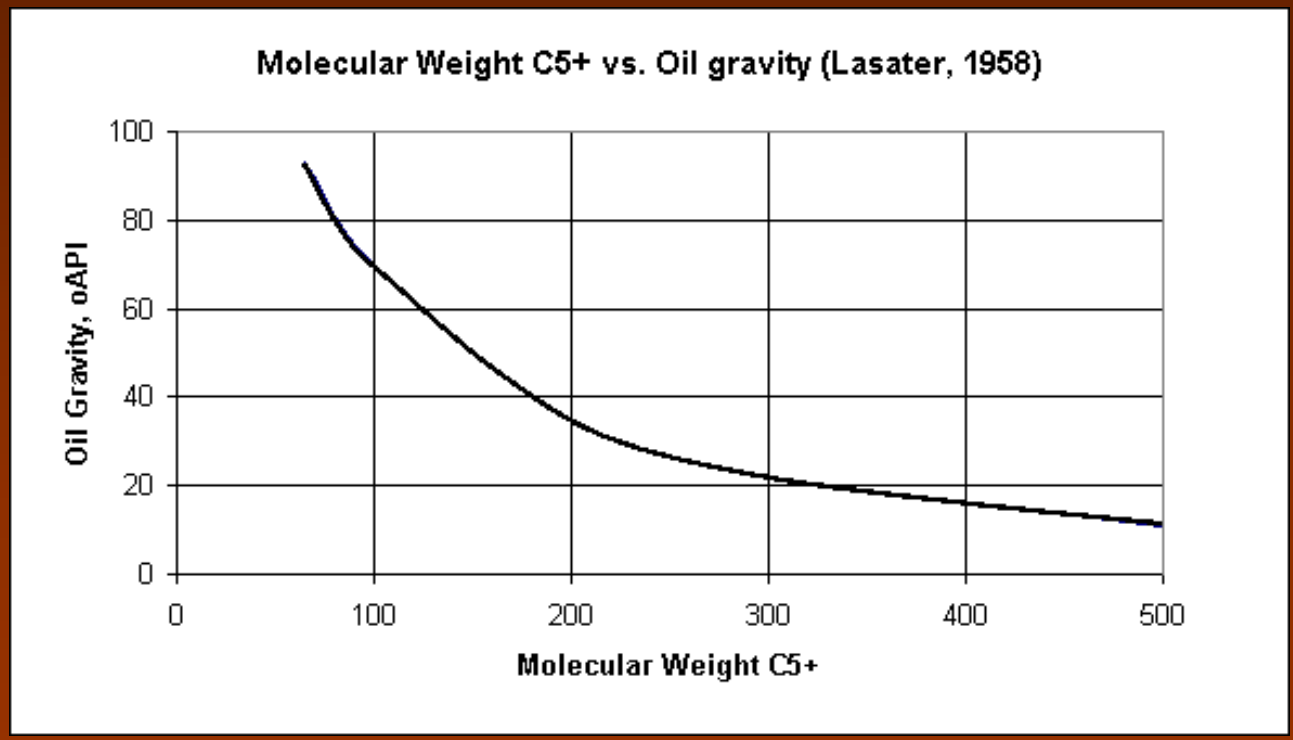


Step 1: Technical Feasibility

Stage 1: Screening of candidate reservoirs (Minimum Miscibility Pressure Calculations)

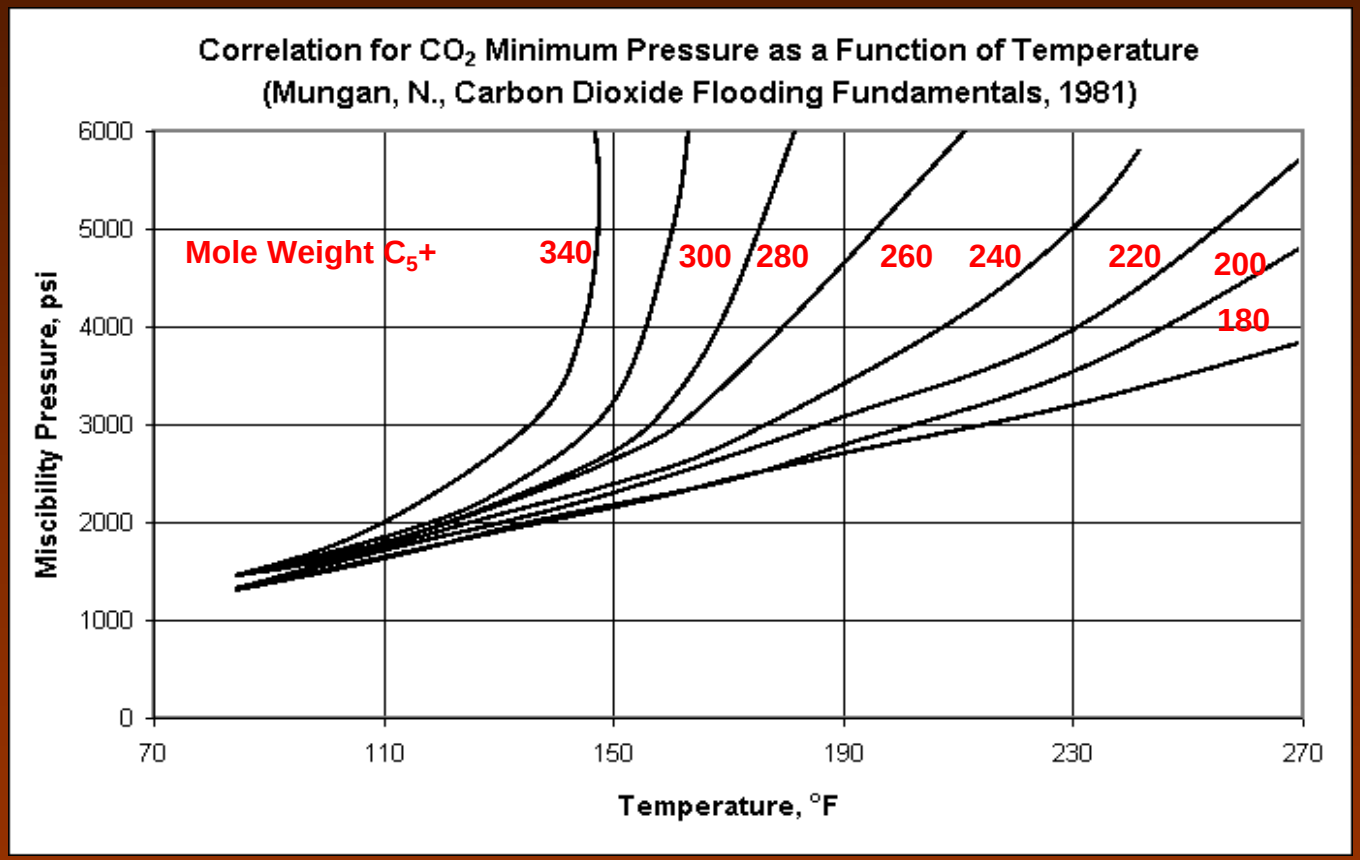
- Function for Obtaining Oil C_5+ Molecular weight

$$MW = \left(\frac{7864.9}{^{o}API} \right)^{\frac{1}{1.0386}}$$



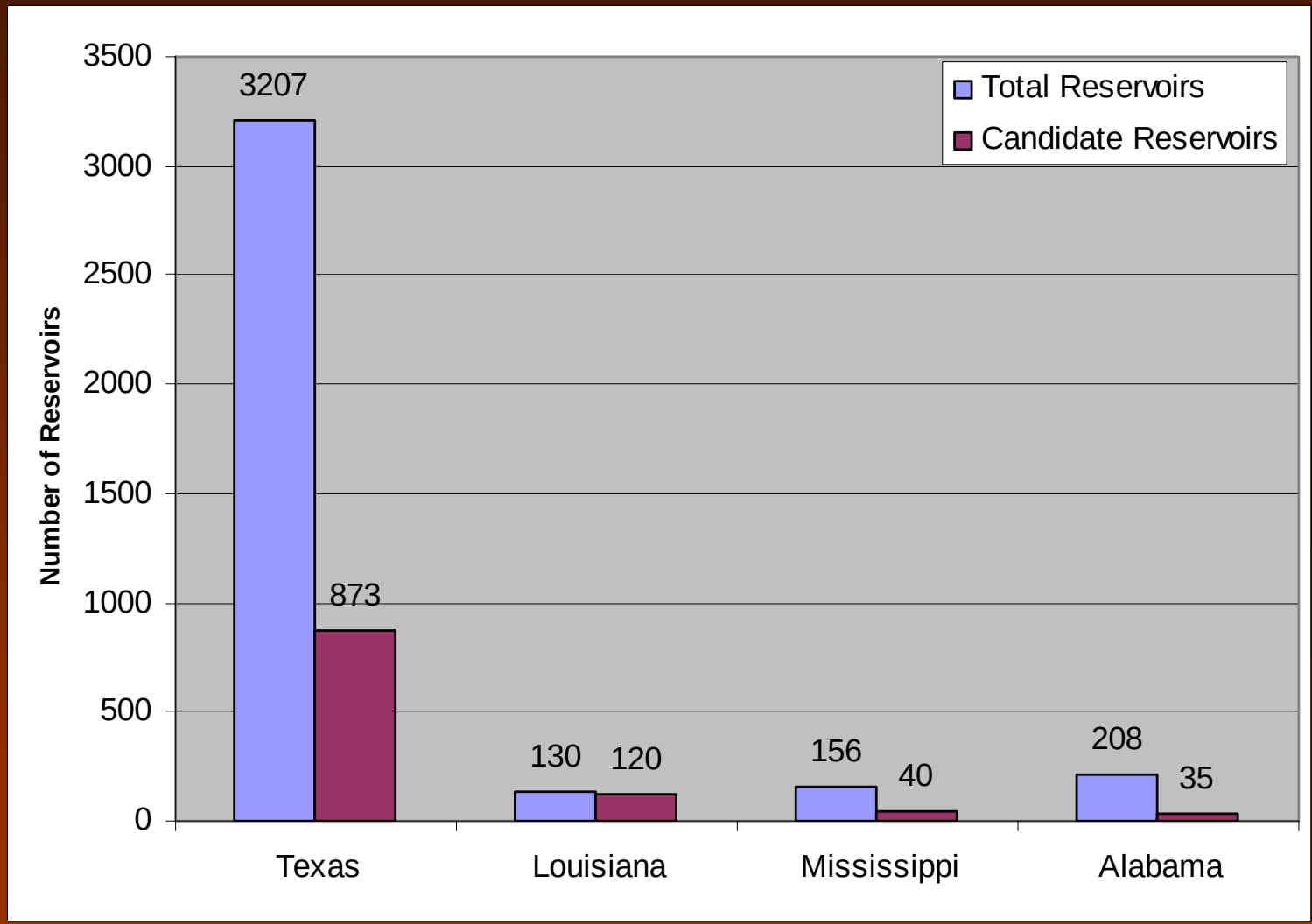
Stage 1: Screening of candidate reservoirs

- Estimating CO_2 Minimum Miscible Pressure



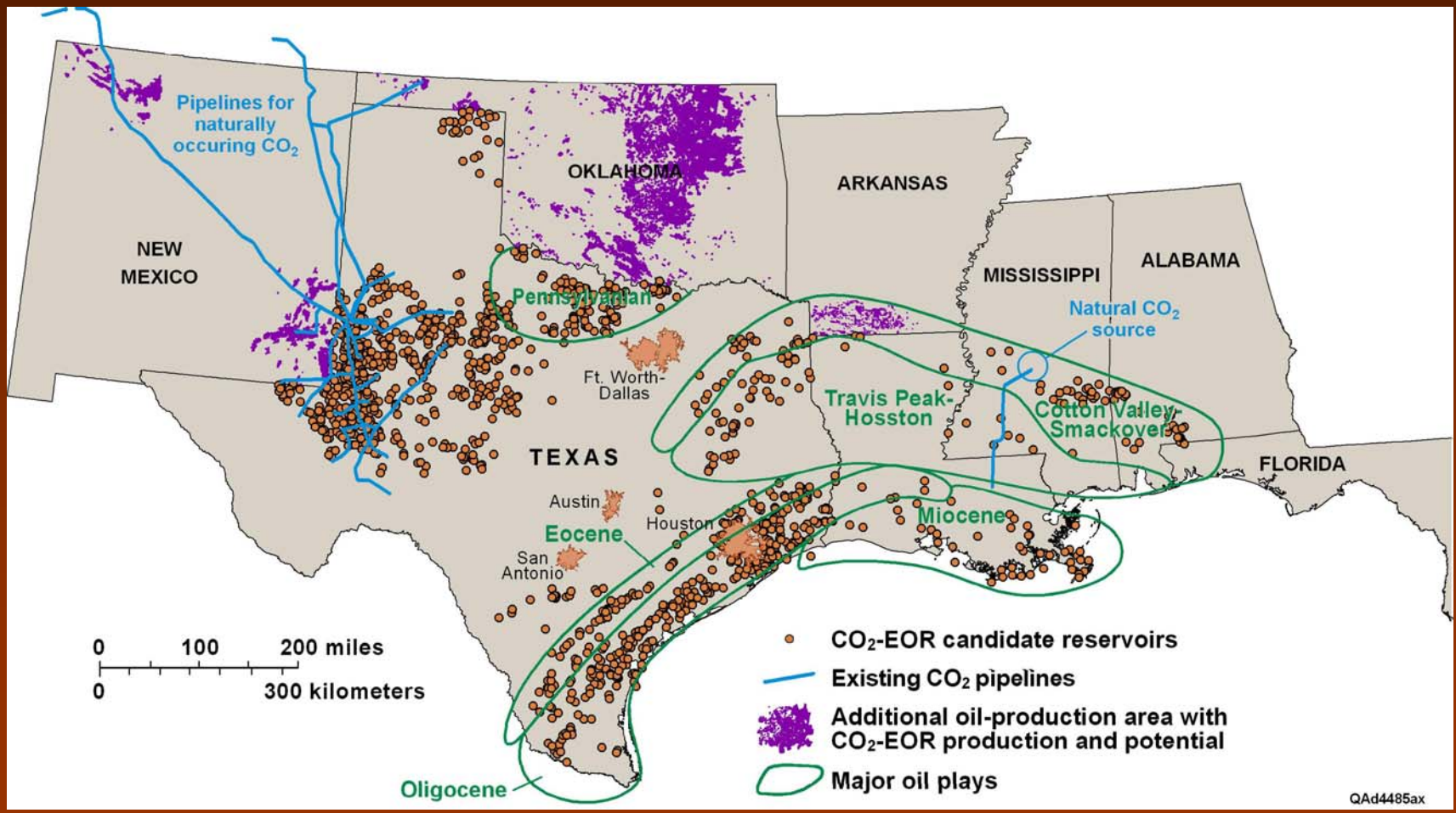
$$MMP = -329.558 + (7.727 * MW * 1.005^{T}) - 4.377 * MW$$

Stage 1: Screening of candidate reservoirs (Step 2 Results)



Stage 1: Screening of candidate reservoirs (Step 2 Results)

Areas with Miscible CO_2 EOR Potential



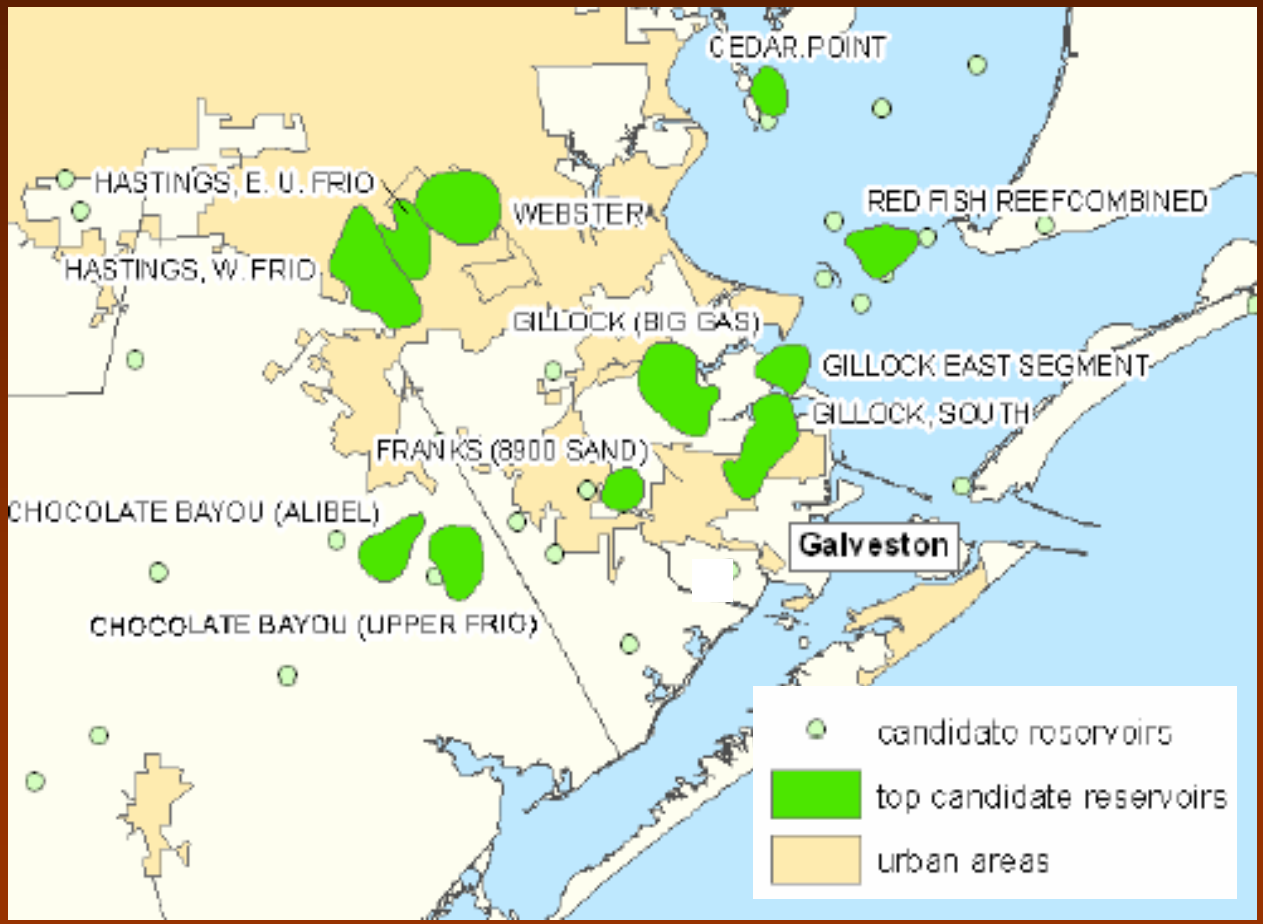
Stage 1: Screening of candidate reservoirs

Step 2: Integration to the geological and economic setting

Candidate Assets	Candidate Liabilities
Field unitized	Questionable seals
Cumulative oil production greater than 1 MMSTB	Extreme reservoir heterogeneity
Short distance to CO_2 source	Reservoir in urban area

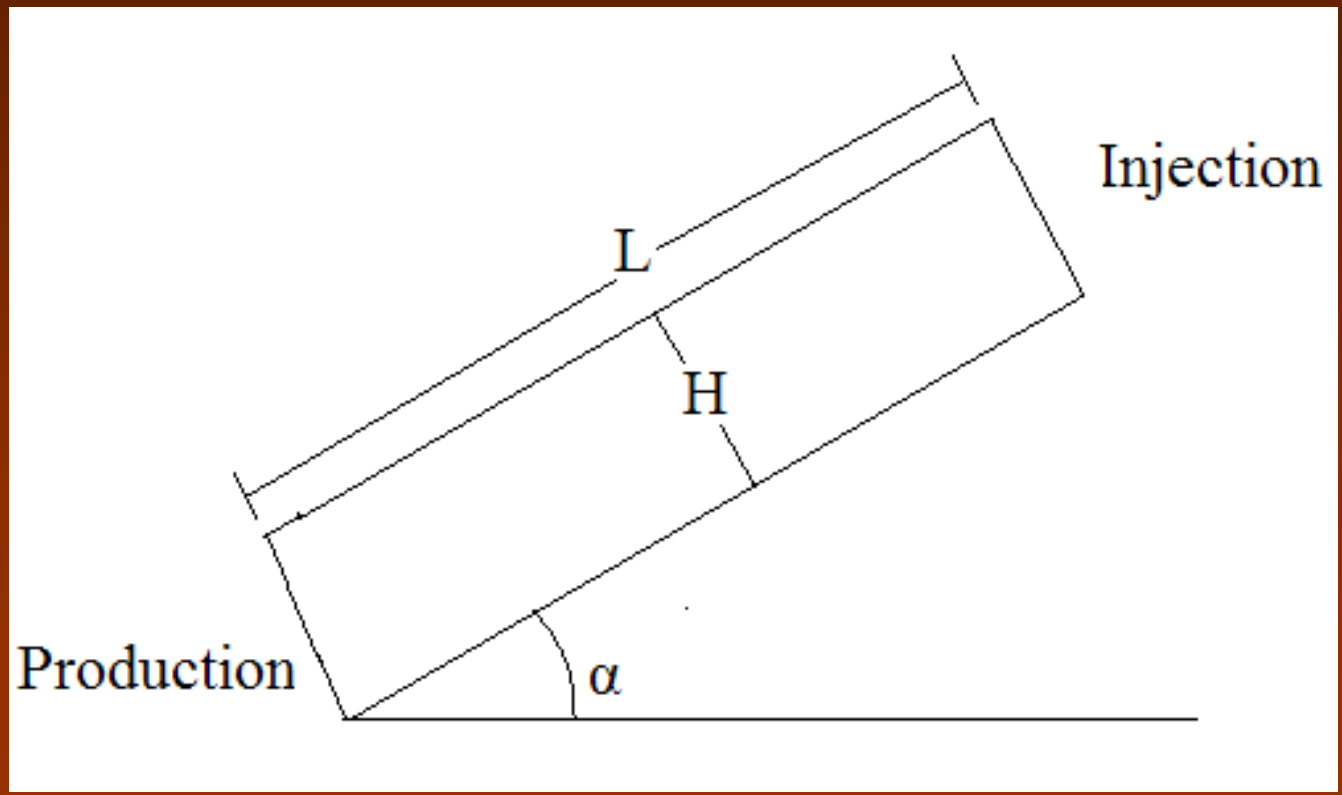
Stage 1: Screening of candidate reservoirs (Step 2 Results)

- Galveston area map with candidate reservoirs for CO_2 EOR Storage



Stage 2: Dimensionless Quick-Look model to estimate recovery and sequestration potentials

Homogeneous, Cartesian rock volume with realistic petrophysical properties



Dimensionless Groups

$$R_L = \frac{L}{H}\sqrt{\frac{k_z}{k_x}} \qquad N_\alpha = \frac{L}{H}\tan\alpha$$

$$Mw^0 = \frac{k^0{}_{rw} * \mu_0}{k^0{}_{ro} * \mu_w} \qquad Mg^0 = \frac{k^0{}_{rg} * \mu_0}{k^0{}_{ro} * \mu_g}$$

$$N_g^o = \frac{H\Delta\rho g\cos\alpha}{\Delta P}$$

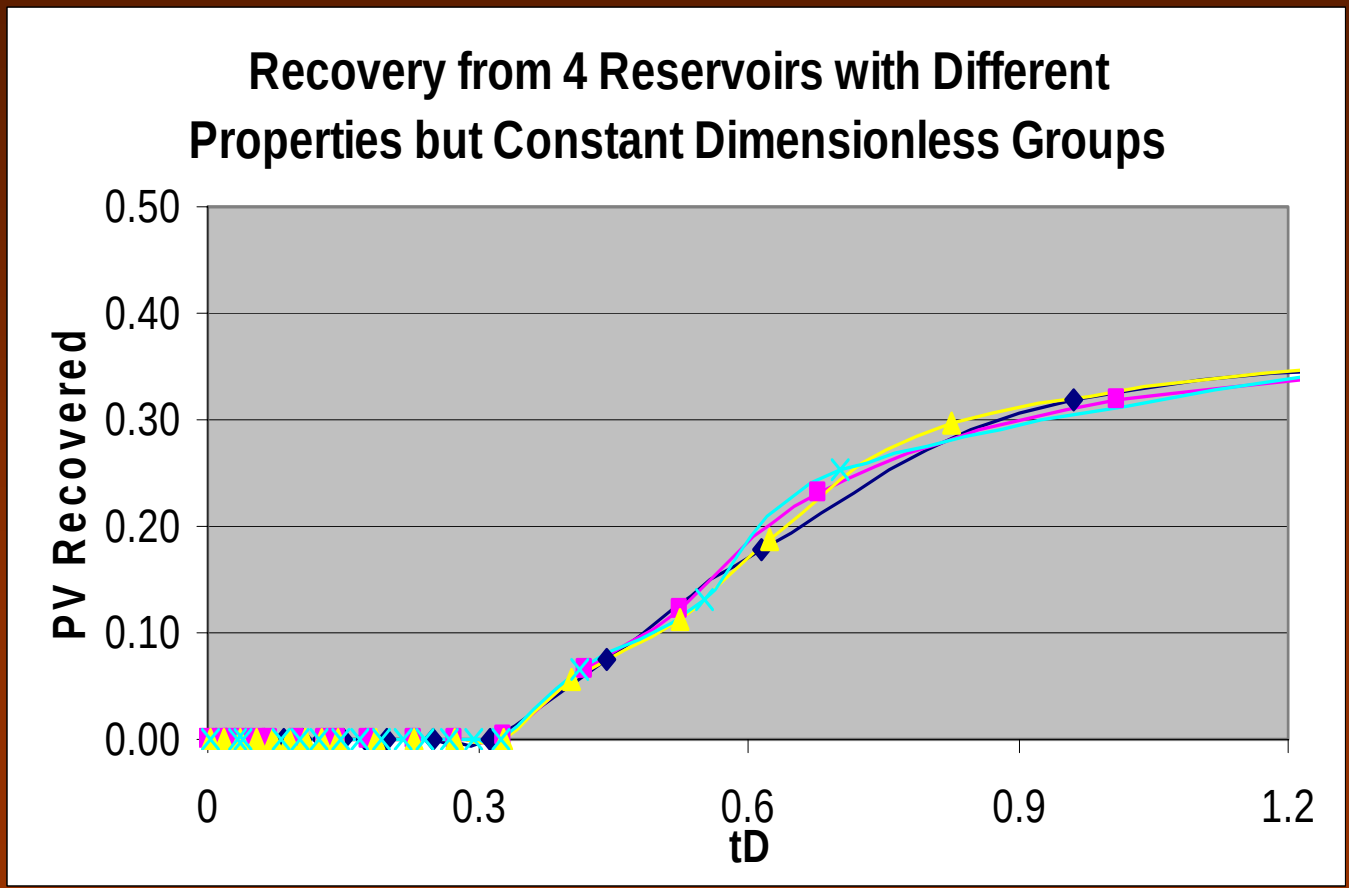
Additional Groups

$$P_{injD} = P_{inj} / MMP \qquad P_{pD} = P_{p} / MMP$$

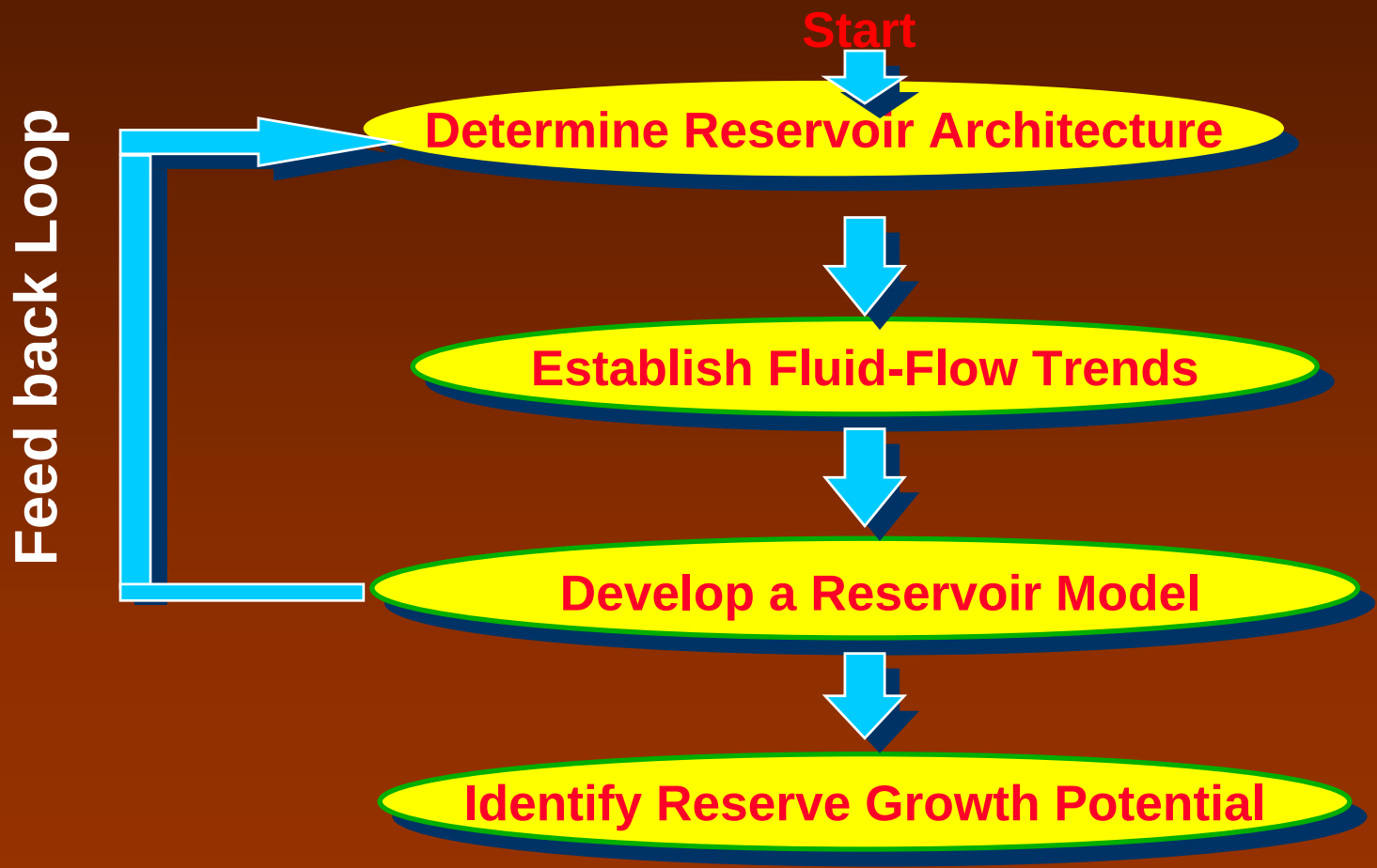
$$S_{oi} \qquad S_{orw} \qquad S_{org}$$

Stage 2: Quick-Look model to estimate recovery and sequestration potentials

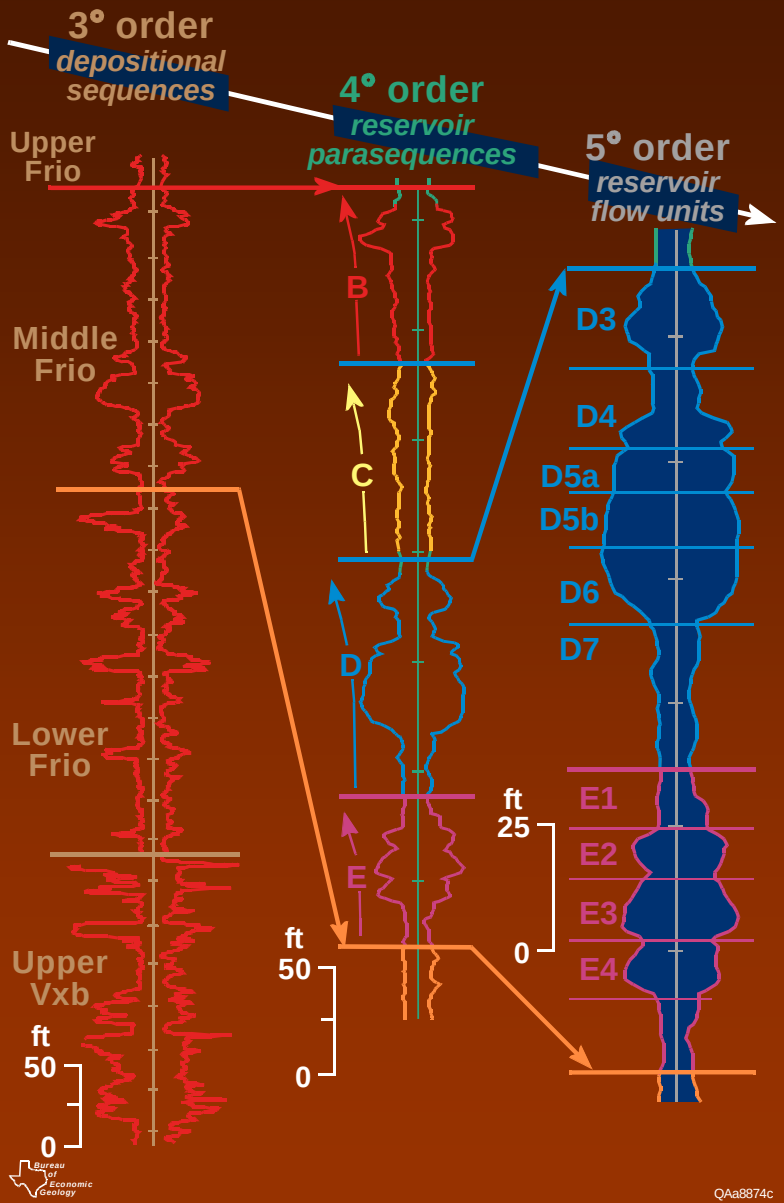
Recovery curves from four different reservoirs with constant dimensionless group values

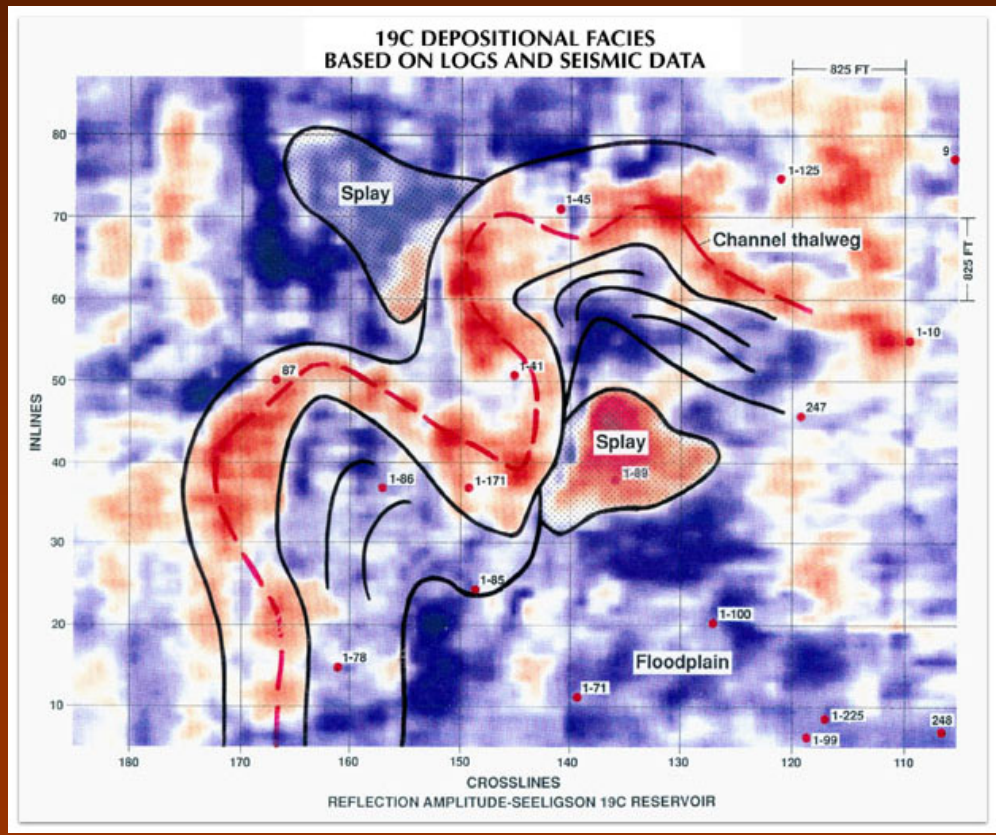


Stage 3: Detailed Reservoir Characterization

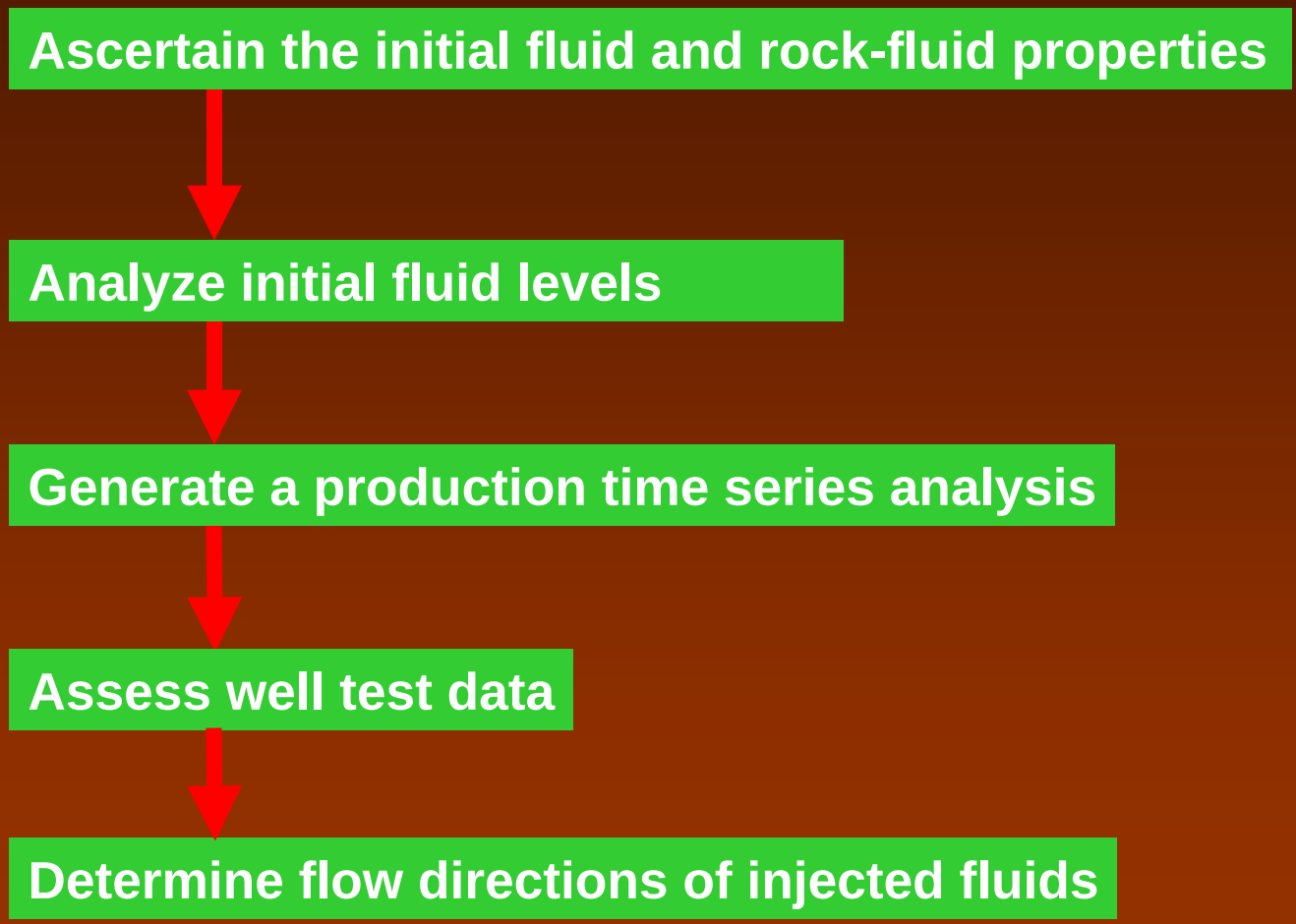


Determining reservoir architecture through correlation and mapping of chronostratigraphic Units

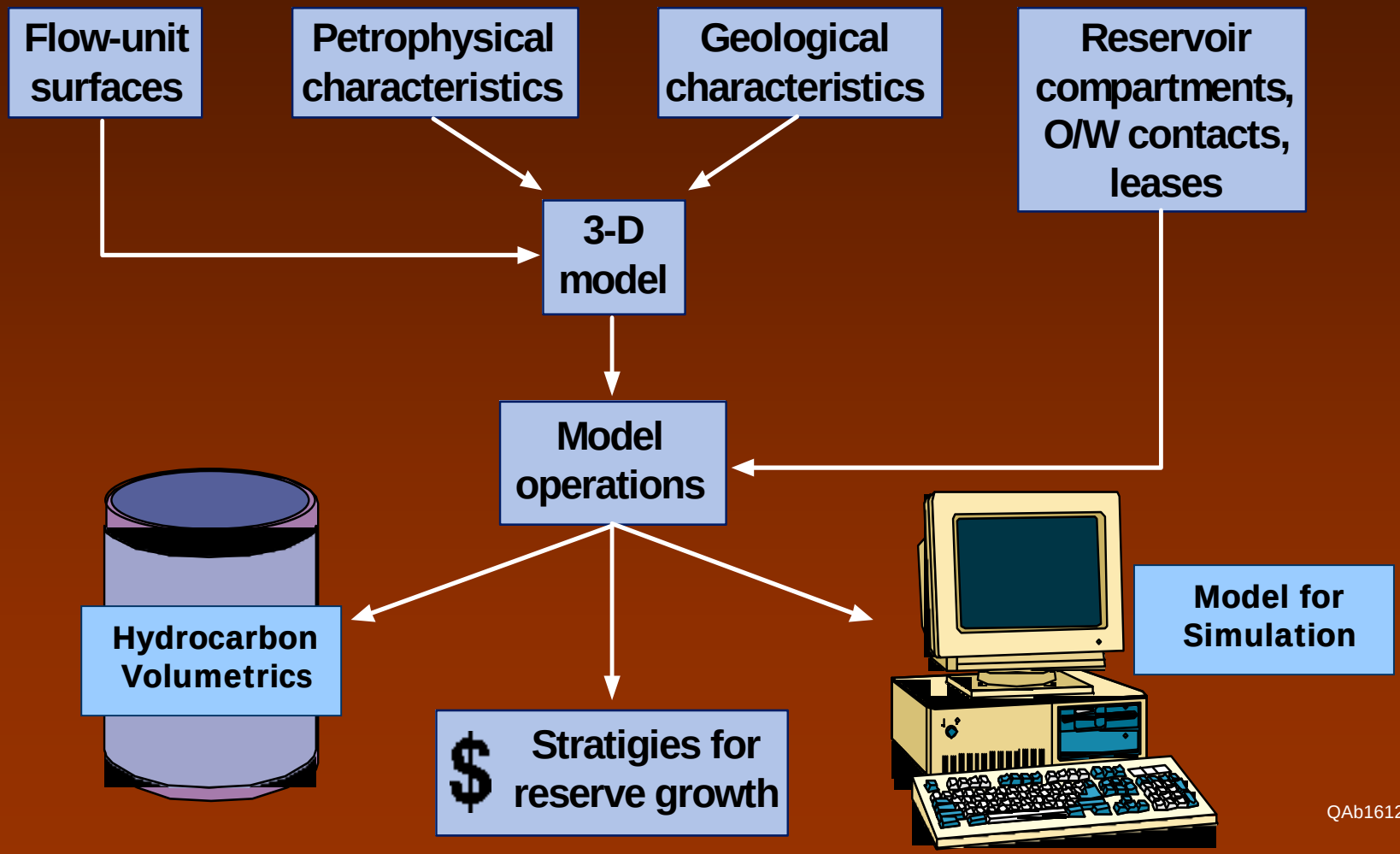




Tasks For Establishing Fluid Flow Trends in a Reservoir

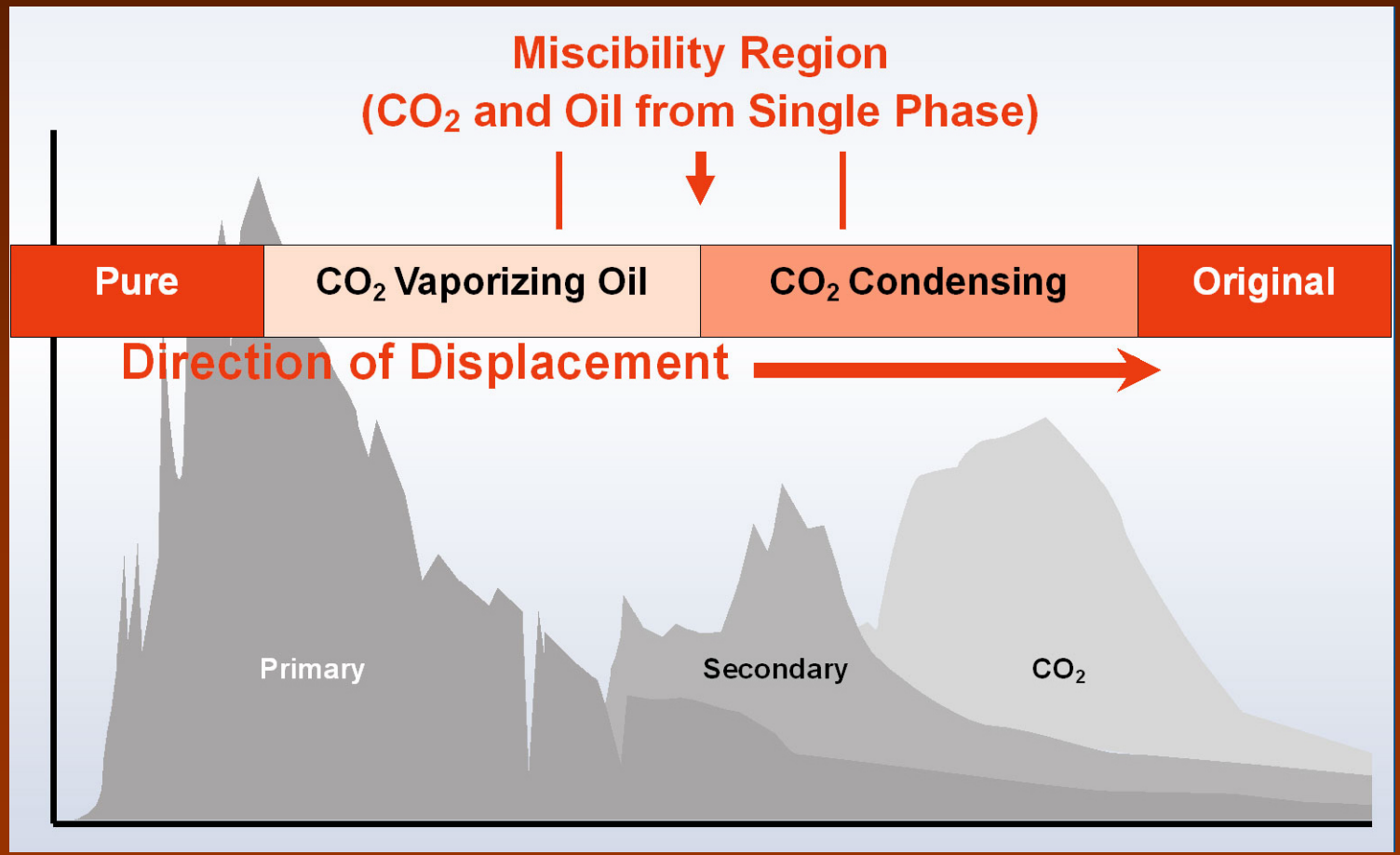


Inputs into a 3-D Geocellular Model



Identify Reserve Growth Potential

1. **Delineate Remaining Hydrocarbon Resource**
2. **Determine Reserve-Growth Concepts (WAG, gravity stable, continuous injection)**
3. **Target Reserve-Growth Opportunities**



Summary

- A large potential for reserve growth lies along the Gulf Coast through the application of CO_2 miscible enhanced oil recovery in more than 1070 candidate reservoirs.
- Results indicate that there is the potential for approximately 4.7 BSTB of addition oil reserves in our study area.
- Texas contains the greatest oil CO_2 EOR potential with a target of over 3 BSTB.
- Multistage methodology allows you to characterize unmanageable number of reservoirs.